Zilog

MCZ-1 Series Microcomputer System

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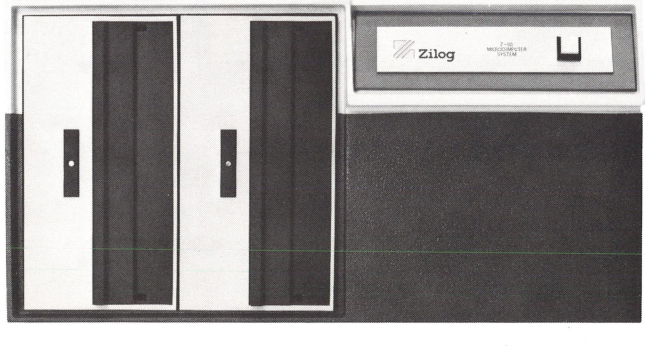
The Zilog MCZ-1 Microcomputer Systems are a series of general purpose computers providing very high performance at a low cost. These systems are designed for high reliability and low maintenance. The MCZ-1 Systems feature the use of the Z80 Microprocessor and its 158 instruction set, a disk based operating system, main storage capacity for up to 65K bytes of semiconductor memory, and two integral floppy disk drives. The MCZ-1 Series consists of units that are free standing, rack mountable and expandable beyond the basic 9 slot card cage that is provided as part of the standard MCZ-1 Microcomputer.

System Features

- Extensive use of Zilog manufactured programmable LSI semiconductor devices.
- Main memory storage capacity of up to 65K bytes of RAM, ROM or EPROM Memory. The standard system contains 3K bytes PROM and 16K bytes dynamic memory.
- Dual floppy disk drives with a storage capacity of 600,000 bytes.
- Serial I/O with RS232 or current loop interface allows the user to communicate via any hard copy or CRT type terminal with the MCZ-1 System at virtually any rate from 10 CPS to 38.4 BAUD.
- Two programmable parallel I/O ports allow simple interface to other peripherals such as a printer.
- Expansion to large number of serial and parallel I/O ports.
- Nine-slot card cage gives the MCZ-1/20 and MCZ-1/25 expansion capability and flexibility for user design options. The MCZ-1/30 features a 12-slot card cage on 1" centers.
- Heavy duty metal chassis.
- Standard software
  - PROM resident I/O drivers, debug package and bootstrap loaders.
  - Resident text editing.
  - Resident Operating System for process or management.
  - Resident ZDOS mass storage file disk based operating system.
  - Resident Macro assembler (relocatable with linking loader optionally available).
  - Optional-Basic Interpreter/COBOL/FORTRAN IV.
  - PROM Programmer capability as an option.
  - Complete documentation package and system support from Zilog.



System Description

The Zilog MCZ-1 Microcomputer System is self-contained in a single chassis and includes dual floppy disk drives. This system features the use of the Z80-CPU as the central processing unit. This device gives the MCZ-1 a large instruction set and makes this system very powerful for general purpose computing applications.

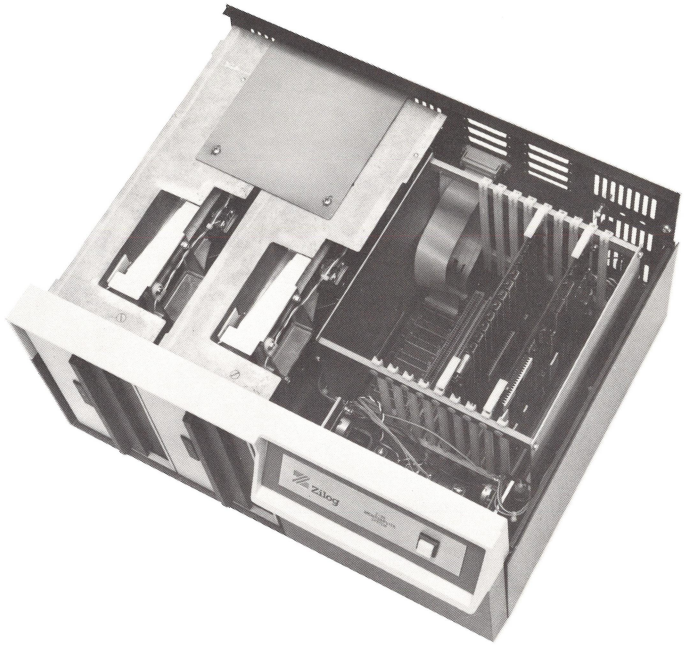
The Basic System contains a RS232 or current loop interface which allows the user to communicate via any hard copy or CRT type terminal without modifications. The communication frequency is set by a switch from 10 CPS to 38.4K BAUD. A total of eight openings for connectors are provided on the rear of the chassis so the optional expansion of serial or parallel I/O ports can be accomplished through standard connectors and flat ribbon cables. The backplane of the cardcage of the MCZ-1 System is wire-wrapped so the user may adapt various other logic cards to the system through the backplane.

The MCZ-1 System has a capacity of nine card slots (a minimum system requires 2 cards) so that user may expand the card set as interfaces to other peripherals are required in the system or for additional memory space. The I/O portion of the peripheral interfaces may then be cabled to the back panel through flat ribbon cable. The system can address up to 8 disk drives without external decoding. The computer module used in the MCZ-1 contains 4 sockets for up to 4K bytes of EPROM or bipolar PROM. The executive firmware requires 3K bytes. The user may take advantage of the extra 1K socket for adding user required add-on program firmware.

Z80-PIO (parallel I/O device) is incorporated in the MCZ-1 CPU module for peripheral interfacing. Interfacing is accomplished by a wire wrap area on the CPU module which allows the user to define port and data select requirements. As a standard option, the system may be supplied with this area wired for a standard printer interface. The Z80-CTC device is used for disk synchronization as well as providing programmable BAUD rate generation. A channel is available to the user for other tasks such as a real time clock application or timing other external devices. The system contains I/O port address decoders which can decode 32 unique contiguous port addresses. Several of these are used to select the channels of the USART, PIO and CTC. Additional decoder port select signals are available for use with other peripherals that may be added to the system.

Powerful Z80-CPU Architecture

The heart of the MCZ-1 Microcomputer System is the Z80-CPU Microprocessor—the most advanced development in state-of-the-art semiconductor technology. Its internal architecture, while directly comparible with preceding generations of CPU's, brings unprecedented power to the world of 8-bit computers. Dual register sets are provided for high-speed interrupt processing and other forms of foreground/background programming. These register sets each include an 8-bit accumulator, program status flags, and six 8-bit storage registers which can also be used as three 16-bit memory address registers. In addition to these, there are two index registers for additional memory addressing capability, a 16-bit pointer to an external stack for unlimited subroutine nesting and temporary data storage, as well as vectored interrupt service routine selection and direct CPU support of dynamic memories requiring periodic refresh.



The instruction set of the Z80-CPU used in the MCZ-1 system is the most advanced in the industry, featuring 4-bit, 8-bit and 16-bit operations and BCD arithmetic and shifting capability. In addition to this, the Z80-CPU is the only 8-bit processor which directly supports both bit and string manipulation. Single instructions can access one bit or up to 65K bytes of data. In all, 158 instructions are available—twice as many as any other microprocessor available now. Some of the most important and unique operation features of this processor are:

- Memory Block moves. Up to 65K bytes can be moved at the rate of 8.4 microseconds per byte with one instruction.
- Memory Block searches. The entire memory of the system can be searched with a single instruction.
- Vectored priority intercept structure. Hardware handlers up to 128 vectored interrupts with loadable registers in peripherals and the CPU.
- Block I/O operations. I/O transfers at rates of up to 125 kilobytes/second can be accomplished under software control.
- Bit Handling. Any bit in any register or memory location can be set, tested or cleared with a single instruction.
- Relative Jumps. Short, two-byte relative control transfers reduce program sizes. Three-byte absolute jumps provice access to any memory location.
- Eight and sixteen bit arithmetic operations provide fast data and address calculations. BCD arithmetic and shifting is also supported.
- Index registers. Two 16 bit index registers and instructions provide additional memory addressing and relocatable coding capability.

Powerful Software Support

The MCZ-1 features a powerful software package that comes as part of the standard system. These features include the following:

- **PROM BASED MONITOR**
- **MACRO ASSEMBLER**
- **FILE MAINTENANCE SYSTEM**
- **EDITOR**
- **DEBUG**
- **UTILITY ROUTINES**

The system includes 3K bytes of dedicated non-volatile memory that consists of a debugger, floppy disk driver and a boot-strap routine. These programs allow the user to access a powerful set of overlay programs located in the system Floppy Disk Drives that include the MCZ Executive, ZDOS Operating System, a highly sophisticated editor and assembler. The MCZ-1 Software User's Manual provides extensive details on the software. Optional software includes a more comprehensive RIO Operating System including relocatable assemblers and linking loader, Basic Interpreters, PL/Z, COBOL and soon to be added FORTRAN IV.

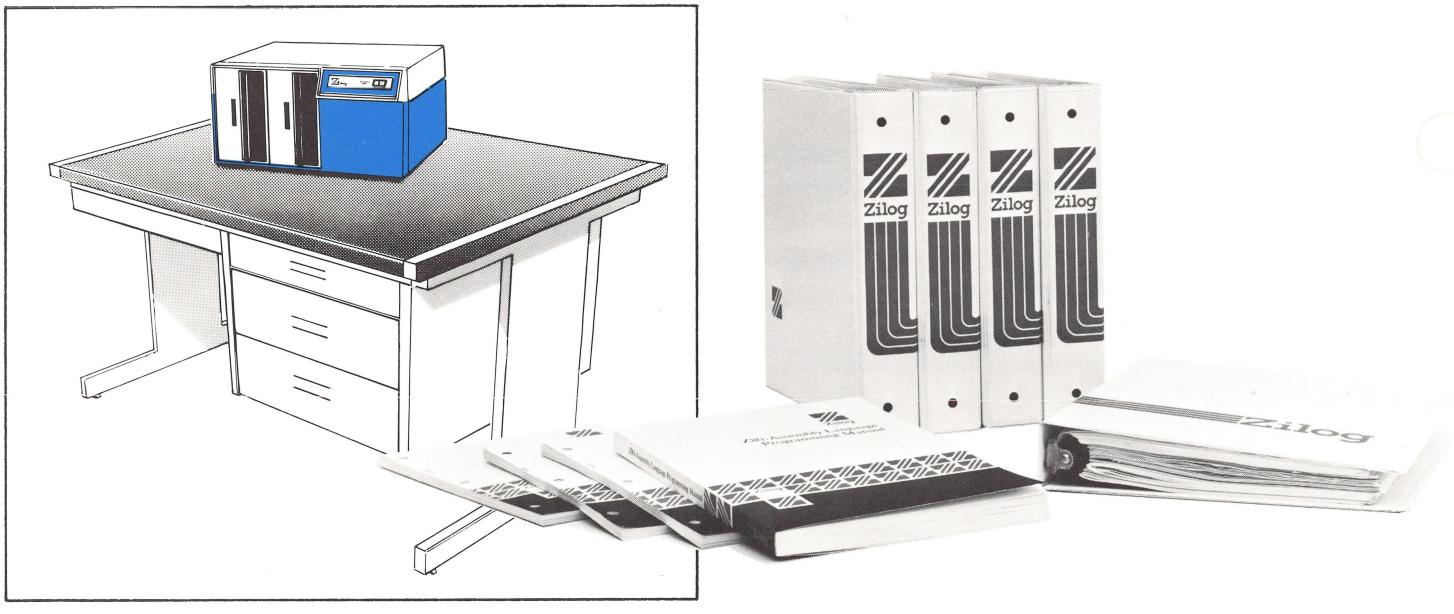
An extensive Software Library and Zilog User's Group immediately provides a wide range of software programs to the MCZ-1 user.

More Flexibility with the MCZ-1 Series Microcomputer

Extensive use of high density large scale integration programmable semiconductor devices throughout the system provides a range of system flexibility not previously available.

MCZ-1/20

MCZ-1/20: The MCZ-1/20 is designed as an attractive freestanding unit that can become part of a general purpose computer system. The MCZ-1/20 features a heavy duty sand cast front panel that has been designed to be displayed on the top of a table or in conjunction with a series of peripherals (see Illustrations 1 and 2). The MCZ features reset and break buttons mounted on the front and an attractive color combination. It is mounted on rubber casters and will not mar any surface it is placed on.



Features

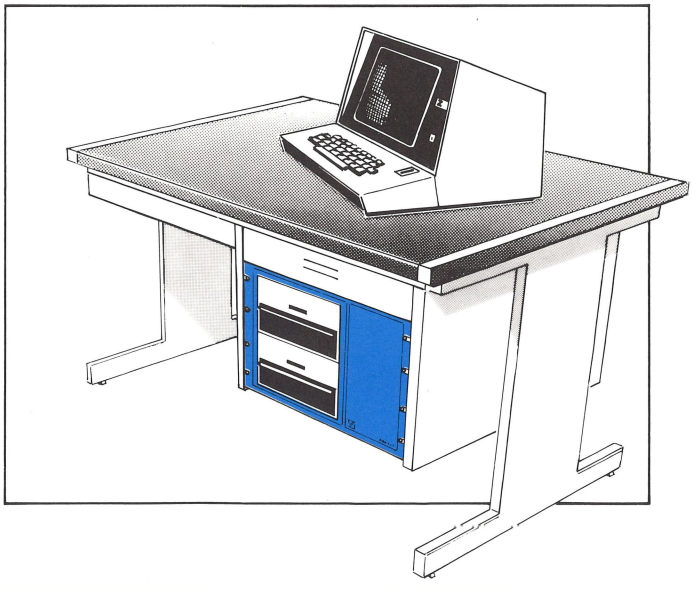
- Basic 9-slot card cage; expandable to 65K bytes of memory in 16K byte increments.
- Dual floppy disk drives capable of storing up to 600,000 bytes of program and data.
- The MCZ-1 disk controller is capable of addressing up to 8 floppy disk drives. Optional RIO software package gives the user the ability to communicate with up to 8 floppy disk drives.
- Additional bulk storage available. This includes cartridge and fixed disk drives with capacity from 12 megabytes up to 96 megabytes. (These are described in the section marked "Expansion Capability".)
- 8 connector locations mounted on the rear for ease of expansion or connection of peripheral devices like Zilog's CRT terminals, line printers or additional mass storage. Contains integral cooling fans and power supply.
- Additional serial and parallel I/O is available with the IOB and SIB boards. (See section on last page.)
- Expansion to 65K bytes of memory with the PMB PROM Memory board and RMB RAM Memory board (see last page).

MCZ-1/25

MCZ-1/25: The Model 25 is a rack mount version of the MCZ-1 that fits into a standard 19" retma relay rack. This System is suited for mounting inside a cabinet or desk or in a freestanding rack. It has its own sidemount slides for easy access to any part of the System.

Features

- Can be expanded to 65K bytes of main memory.
- Two floppy disk drives of 600K bytes of memory.
- System I/O can be expanded by using optional IOB or SIB boards. Analog boards also available.
- All other features of the System are the same as shown in the MCZ-1/20.
- This system also has mass memory expansion; cartridge and fixed disk drives supply 12 to 96 megabytes of bulk storage.

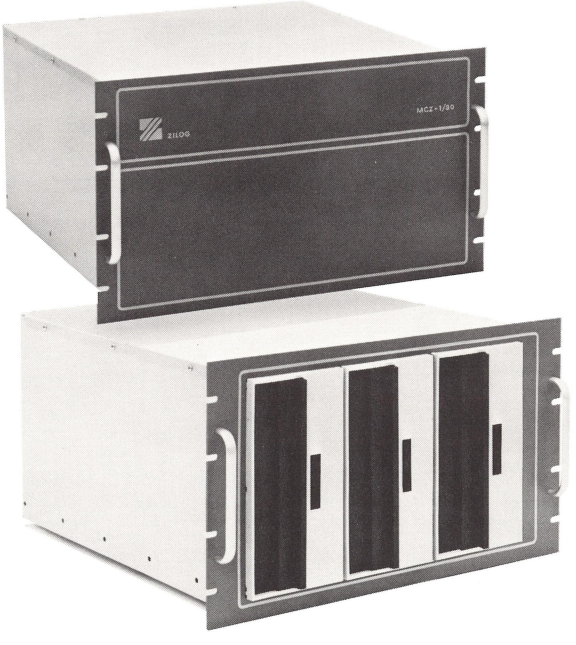


MCZ-1/30

MCZ-1/30: The Model 30 is a rack mountable version of the MCZ-1 that fits into a standard 19" retma relay rack. This system features the use of a 12 slot card cage with connectors mounted on 1" centers for use in adding wire wrap cards.

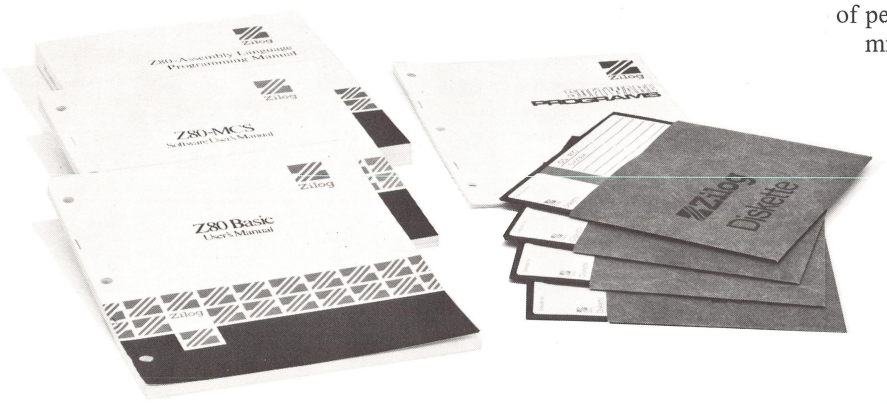
Features

- Two floppy disk drives contained in a separate chassis that can be mounted below the MCZ-1 chassis. This second chassis has the capability of handling a third floppy disk drive.
- Expansion to 65K bytes of main memory.
- 1" spacing allows room for user and Zilog expansion.
- Memory can be expanded with up to 8 floppy disk drives or multiple cartridge and fixed disk drives for 12 to 96 megabytes of storage.
- Separate rack mount cabinets contain optional cartridge disk drives or floppy disk drives.
- The Model 30 is especially useful in laboratory or special design environments where maximum flexibility is needed. The System I/O can also be expanded by use of the IOB, SIB and Analog board sets.



The Model 30 is 10.5" high with the floppy disk chassis adding an additional 10.5" to the System. Two or three floppy disk drives are available in the second chassis.

Zilog Software Support Options



Zilog supplies high quality software and documentation to all MCZ-1 users. The Zilog RIO Operating System rivals the operating systems offered with minicomputers. The Z80 Processor and Zilog software are setting new standards of performance and level of software support for microprocessor-based systems. The optional RIO operating system features include:

- Text Editor that is line and character oriented. "Infinite" size files are handled via an automatic roll feature of program into and out of memory from disk. Search, delete and replace commands operate on strings of characters.
- OS Executive maintains mapping between logical files and physical devices in active device tables.
- Macro Assembler generates relocatable object code with external references and global definitions. Include module capability and conditional assembly is is also supported.
- Linker established absolute program module address. Software programs can be written in modules and linked together.
- Advanced file structure gives user access to file handlers and file protection. File attributes include data, directory or ASCII files, length information, protection-read only, erase protection, locked secret, date of creation, date last written.
- Supports up to eight floppy disk drives.
- ZDOS II allows indexed sequential access to files and random access to records.

Under our powerful operating System, Zilog has created the broadest range of optional languages available on any microprocessor.

PL/Z

PL/Z: PL/Z is Zilog's own system implementation language. Designed specifically with the system programmer in mind, PL/Z provides an extremely sophisticated structured programming environment. Implemented at two separate language levels and in distinct translator packages, PL/Z offers a complete solution to microcomputer system programming problems.

In its highest level, PL/Z is a fully block structured language with an IF–THEN–ELSE clause, a case selector (actually implemented in the syntax of the IF statement), block REPEAT and EXIT statements, procedure references and, of course, RETURNs. Data types include BIT, BYTE, WORD, POINTER as well as ARRAYS of any single type and RECORDs composed of groupings of the various basic types, arrays, or even other records.

At this language level, both an Interpreter and a Compiler are available. The interpreter provides a fast and convenient means of program development and debugging, while the highly efficient Compiler generates Z80 Object code.

For applications requiring total control of hardware resources, a second level of PL/Z provides all the block structuring and control conventions of the full compiler, but uses assembly language statements rather than compiler level expressions and assignments. Thus, it acts as a PL/Z compatible structured assembler and produces code which can be linked directly to modules translated by the compiler.

Regardless of the scope or complexity of a systems programming problem, PL/Z will provide a simple, elegant, and complete environment for its solution.

Fortran IV

FORTRAN: FORTRAN has long been accepted as the standard for scientific programming and is the "native" language of many part-time programmers. Zilog supports FORTRAN with a compiler conforming to the ANSI 1966 specification. This level of FORTRAN is commonly referred to as FORTRAN IV.

Full conformance to the generally accepted ANSI standard insures that accumulated libraries of FORTRAN programs will be immediately usable in the MCZ-1 environment. There is no need to translate to a special microcomputer language. Zilog FORTRAN opens the door to the richest traditions of scientific programming in a small, inexpensive environment.

All software is supplied on floppy diskette media. Each package comes complete with object software, technical and user documentation, and instructions for use with the MCZ-1 System.

Cobol

COBOL: The MCZ-1 series provides full support of the most widely used business programming language. COBOL has been developed in strict accordance to ANSI '74 standards with special enhancements for the microcomputer market. At the root of the language is an ANSI '74 Level 1 COBOL–without compromise. Beyond that, many Level 2 features have been incorporated to make Zilog's COBOL more powerful in every instance where the fundamental speed and size of the package is extremely important. In addition to this, special display-oriented features (ACCEPT, DISPLAY, etc.) have been added to the language in anticipation of a strong emphasis on data entry applications in the microcomputer environment. A powerful debug structure has also been added to support the highly interactive techniques unique to microcomputer program development.

Basic

BASIC: Zilog's newest Extended BASIC Interpreter sets a new standard in precision and speed performance for the most popular microcomputer language. Two versions of the system—a version of business BASIC with a 13 digit BCD data type—and a scientific version with the conventional 32 bit floating binary data type—guarantees the optimal mix of speed and precision for any application from professional quality business data processing to extensive scientific calculations. In both of these versions, a 16 bit integer data type provides compact storage and rapid computation for status control variables. Finally, the string data type permits manipulation of variable length text in a uniquely powerful subscripted notation. Both interpreters have extensive access to disk files through Zilog's ZDOS II disk operating system.

Internally, the Zilog BASIC Interpreter has advanced the state-of-the-art in microcomputer language both in its mathematical packages and in its method of variable reference. Transcendental functions supplied in the Zilog BASIC package use the powerful technique of rational approximations to limit the number of arithmetic operations performed in their evaluation while guaranteeing accuracy. The fundamental arithmetic operations all use rounding of results rather than truncation to further enhance system accuracy. The Interpreter itself maintains all variable references in an encoded form to eliminate the need for execution time symbol table searches. As a result of these advances, BASIC provides the convenience of an interpretive environment, speed normally not found in an interpreter and random access to disk files through a sophisticated disk operating system.

Expansion Capability

The MCZ-1 Microcomputer Systems were planned to meet the requirements of a wide range of users. The software is organized in layered modular structures for minimal impact in adding new software. The standard bus structure allows the use of modular boards each packaged with very high density LSI components for maximum reliability and programmable performance. Additional boards allow expansion of the number of serial and parallel I/O channels and memory expansion to 65K utilizing RAM, PROM or ROM. The MCZ-1 standard peripherals include CRT terminals, printers, floppy disk drives and fixed disk drives.

Features

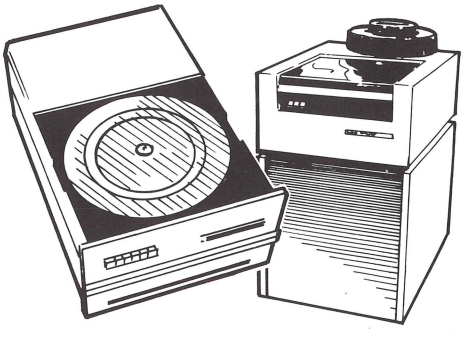
The MCZ-1 Series features a unique system organization utilizing an intelligent disk controller. Instead of bringing the disk to the processor, ZDOS is located in a controller at the disk. ZDOS is downloaded to high speed memory at the disk. The controller has its own processor and high density LSI to handle access to files and records. This multiprocessor configuration provides an order of magnitude in increased system performance over previous approaches. Interaction with the disk files are now handled on a logical level—maximal disk transfers occur independent of the main system processor.

Zilog supplies a range of fixed disk expansion. The intelligent controller allows expansion up to four drives. The disks are available as 2315 front load or 5440 top load drives. The head positioning uses advanced voice coil and servo technology to provide fast access and virtually wear-free performance.

- **Disk Features**

– 35 Millisecond access time.
– Recoverable error rate less than 1 x 10^{10} bits. Built in thermal compensation.
– ±1% spindle speed control
– 2400 RPM with data transfer rate of 4400 bpi.
– 12 megabyte dual platter.
– 24 megabyte dual platter (5440 top load only)

- CRT terminal features 24 lines by 80 characters, upper and lower case ASCII keyboard, detached keyboard with ten key numeric pad and software controlled cursor.
- High speed line printers up to 600 lines per minute. Impact printing for multiple copies. Interface uses standard system parallel type printing.
- Floppy disk drives with storage of 300K bytes in each drive. Average latency is 80 milliseconds and track-to-track access time is 10 milliseconds at a rotational speed of 360 RPM.
- Additional mass memory using storage modules of 80 Megabytes will be available in the future.



Specifications and Options

The MCZ is designed to be a powerful general purpose microcomputer with a wide selection of optional boards to allow the user to "customize" the system to fit his particular application. The following details the basic system specifications and optional items.

MCZ Specifications

MEMORY STORAGE: Up to 65K bytes of main storage

WORD SIZE: 8 bits (1 byte)

DISK STORAGE: 600,000 bytes (300K per drive). Dual density floppy capability will be available at a later date.

SYSTEM DIMENSIONS: 19" wide x 16" deep x 10" high

SYSTEM WEIGHT: 66 lbs. including disk drives

USER PANEL: consists of two (2) lighted system reset and break buttons.

COOLING: System contains its own cooling fan which enters and exits air through the rear of the unit.

CONNECTORS: Eight (8) connector locations are available at the rear of the chassis.

ON/OFF: An on/off switch is located at the rear of the unit.

ENVIRONMENT: 0°C–40°C operating temperature range.

I/O CHANNELS: Serial I/O port with RS-232 or 20mA current loop interface; two (2) software configurable bidirectional 8-bit parallel I/O ports. Expansion via optional SIB, IOB, AIO, AIB Boards.

Software Program Options

BASIC INTERPRETER: This allows the user an interpreter to write and debug problems interactively. This is a powerful programming tool that is offered as an option to the MCZ user.

RIO: This allows the user to add a relocatable assembler, linking loader and Random Access to the MCZ.

COBOL: ANSI 1974 Level 1 Business Cobol

FORTRAN: Fortran IV, ANSI 1966

PL/Z: Zilog's system programming language

Optional Documentation

PROGRAMMING MANUAL: Gives detail on each instruction in the Z80 set.

Z80-CPU MANUAL: Gives specific details on the Z80-CPU Processor Device that is used as the heart of the MCZ Microprocessor System.

Optional System Modules

RMB: This memory board contains 16K bytes of RAM memory consisting of 4K dynamic RAM devices. This board contains 8 sockets for expansion of ROM or PROM memory.

IOB: This parallel I/O board allows the user to expand the MCZ-1 System by 8 input and 8 output ports per board. the user can utilize more than one of these boards if needed.

SIB: This Serial I/O Board allows the user to expand the MCZ-1 System with 4 programmable full duplex channels per P.C. board, including modem control.

AIO/AIB: These boards allow the MCZ-1 systems to monitor up to 32 analog signals per board and generate two analog output signals per board.

PMB: This PROM memory board contains 16 sockets for the expansion of additional PROM memory within the MCZ-1 System. This board also contains 2 parallel I/O ports and 4 counter/timer channels.

EXB: This Extender Board allows the user to extend any of the P.C. boards located in the MCZ System.

WWB: This Wire Wrap Board allows the interfacing of special features with the MCZ System.

PPB: PROM Programmer Board. Allows the user to program PROMs or EPROMs electrically.

System Documentation

MCZ HARDWARE USER'S MANUAL: Contains the information required to explain the basic operating characteristics of the MCZ System.

MCZ SOFTWARE USER'S MANUAL: Contains the information required for the user to properly use the system and its basic software packages.

MCZ SCHEMATIC SET: Details the logic and schematics of the MCZ System.

MCZ PROGRAMMER'S REFERENCE CARD: Details the Z80 instruction set and other valuable information in a pocket size form.

10460 Bubb Road, Cupertino, California 95014 Zilog Telephone: (408) 446-4666 TWX: 910-338-7621

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